

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
4 September 2003 (04.09.2003)

PCT

(10) International Publication Number
WO 03/072694 A1

(51) International Patent Classification⁷: **C11D 17/04**,
17/00

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(21) International Application Number: PCT/GB03/00100

(22) International Filing Date: 13 January 2003 (13.01.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0204364.4 26 February 2002 (26.02.2002) GB

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,
SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VC, VN, YU, ZA, ZM, ZW.

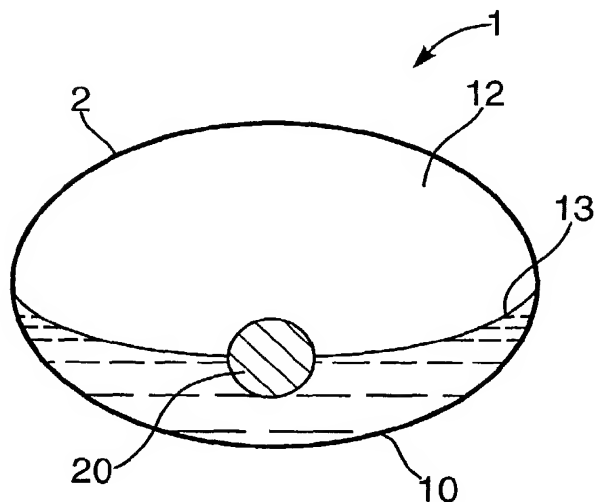
(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI,
SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a
patent (Rule 4.17(ii)) for all designations*
- *of inventorship (Rule 4.17(iv)) for US only*

[Continued on next page]

(54) Title: PACKAGED DETERGENT COMPOSITION



(57) Abstract: A packaged detergent composition comprising a container that at least partly disintegrates in an aqueous environment, the container having at least one compartment, the detergent composition having at least one fluid phase and at least one solid substantially insoluble in the fluid phase and having a size sufficient to be retained by a 2.5 mm mesh wherein the movement of the at least one solid within the container is restricted, as well as its use in an automatic dishwashing or laundry washing machine.



WO 03/072694 A1



Published:

— with international search report

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PACKAGED DETERGENT COMPOSITION

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The present invention relates to a packaged detergent composition comprising a container that at least partly disintegrates in an aqueous environment, the container having at least one compartment, the detergent composition having at least one liquid and at least one solid substantially insoluble in the liquid and having a size retained by a 2.5 mm mesh. The invention is particularly useful in automatic dishwashing machines and laundry washing machines.

It is known to use packaged detergent compositions, disintegrating in an aqueous environment, for example, because of being made of water-soluble material. Such containers can simply be added to water in order to dissolve or disperse its contents thereinto.

It is also known to manufacture such containers having more than one compartment to enable presence in the same container of compositions having some kind of mutual incompatibility.

It has equally been proposed to enclose more than one composition in the same compartment of such package, which may then have one, or more than one compartment. Examples of this can be found in Swiss patent application number 347 930, European patent application number EP 0 233 027 A2 and European patent number EP 0 507 404 B1.

It has been found, however, that when solids, having a relatively big size (more than 2.5 mm), are packaged

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5 within a container of the above type comprising a liquid composition the solids may interact with the walls of the packages developing a number of potential problems.

10 A first undesirable type of interaction is a chemical interaction and may arise when the composition of the solid comprises substances with some degree of incompatibility with the material of the [water-soluble] container. Examples of these situations may arise when a solid comprising a cross-linking agent (i.e. borate) are
15 contained in [water-soluble] a container made of polyol materials (i.e. polyvinyl alcohol) or when a solid comprising a strong oxidant (i.e. chlorine bleach) are contained within a container made of a oxidation sensitive material. This type of interaction may cause
20 from one side a loss of integrity of the package but also a substantial change of the physical properties of the container (most notably its speed of dissolution).

25 A second type of interaction is a physical interaction and may arise from the friction of the solid(s) with the walls of the container when the container is moved (i.e. during handling or transportation). This friction can damage the material of the container (i.e. by enlarging the size of already
30 existing pores) and cause leakage of the liquid contained in the container.

It is the object of the present invention to provide a packaged detergent composition of the above described
35 type avoiding at least the second of (physical interaction), preferably both (chemical and physical

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5 interaction) of the above-mentioned undesirable types of
interaction between the solid contained in the container
and the container walls.

This object is solved by restricting the movement of
10 the at least one solid within the container.

In a first alternative of the present invention it
is proposed to restrict the solid's movement by having
the at least one liquid having an interface with either
15 another liquid or a gas and selecting the density of the
solid to float at said interface.

The simplest execution of this alternative is to
package a liquid (by the use of the word liquid we
20 include gels) leaving a free space filled with a gas,
preferably air or any other gas, while selecting the
density of the solid to make it float at the liquid gas
interface.

25 Another possible execution of this first alternative
is to use two non-miscible liquids of different densities
while selecting the density of the solid to lay within
the range defined by the density of the two liquid
compositions thereby causing the solid to float at the
30 interface of the two liquids.

In a second alternative under the present invention
the compartment of the package comprising the solid has a
relative size with respect to the size of the solid
35 contained therein such that the movement of the solid
within the compartment is restricted. The package can

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5 have additional compartments of any desired size. Preferred relative sizes of the solid(s) are such that the space within the container in which the solid is held is greater than 20%v/v, ideally greater than 50%v/v than the space occupied by the solid.

10 Preferably there are no more than 5, preferably less than 3, individual solid components in any single container. Preferably there is only one discrete solid within a single container. Ideally the solid is a spheroid shape, ideally containing no sharp edges or
15 corners thus reducing damage to the container.

In a third alternative under the present invention the solid is attached at a fixed point on to one or more of the container's walls, preferably at a point, which is
20 sufficiently far from the seal area of the container so that the solid will not contact the seal. It is possible to envisage different executions under this embodiment. One such execution comprises embedding the solid(s) at least partially within the material of the container's
25 walls. Another alternative is to glue the solid(s) to the container's walls.

The present invention provides for a surprisingly simple solution to the above mentioned problems by
30 restricting the free movement of the solid(s) within the container in a number of alternative ways. By imposing the restriction of the solid's movement within the container friction between the solid and the container is eliminated or at least substantially reduced and at the

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5 same time the degree of chemical interaction may also be reduced with some of the alternatives proposed to restrict the solid's movement.

10 In all executions under the present invention the packaging may be formed using different techniques known to the expert in the field of forming water-soluble packaging. As non-limiting examples of such techniques one can mention techniques making use of processes of moulding the water-soluble raw material of the packaging, 15 especially injection moulding or blow moulding, and also techniques making use of a preformed film of water-soluble material such as thermoforming, vertical form-fill-sealing or horizontal form-fill-sealing.

20 In the case of techniques making use of preformed film materials, the film may be a single film, or a laminated film as disclosed in GB-A-2,244,258. While a single film may have pinholes, the two or more layers in a laminate are unlikely to have pinholes, which coincide.

25 The film itself may be produced by any process, for example by extrusion and blowing or by casting. The film may be unoriented, monoaxially oriented or biaxially oriented. If the layers in the film are oriented, they 30 usually have the same orientation, although their planes of orientation may be different, if desired.

The layers in a laminate may be the same or different. Thus, they may each comprise the same polymer 35 or a different polymer.

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5 Examples of water-soluble polymers which may be used in a single layer film or in one or more layers of a laminate or which may be used for injection moulding or blow moulding are poly(vinyl alcohol) (PVOH), cellulose derivatives such as hydroxypropyl methyl cellulose (HPMC) and gelatine. An example of a preferred PVOH is ethoxylated PVOH. The PVOH may be partially or fully alcoholised or hydrolysed. For example it may be from 40 to 100%, preferably from 70 to 92%, more preferably about 88% or about 92%, alcoholised or hydrolysed. The degree of hydrolysis is known to influence the temperature at which the PVOH starts to dissolve in water. 88% hydrolysis corresponds to a film soluble in cold (i.e. room temperature) water, whereas 92% hydrolysis corresponds to a film soluble in warm water.

20

The thickness of the film used to produce the container, which may be in the form of a pocket, is preferably 40 to 300 μm , more preferably 80 to 200 μm , especially 100 to 160 μm , more especially 100 to 150 μm and most especially 120 to 150 μm .

In one possible execution using film material the packaging may be formed by, for example, vacuum forming or thermoforming. For example, in a thermoforming process the film may be drawn down or blown down into a mould. Thus, for example, the film is heated to the thermoforming temperature using a thermoforming heater plate assembly, and then drawn down under vacuum or blown down under pressure into the mould. Plug-assisted thermoforming and pre-stretching the film, for example by blowing the film away from the mould before

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5 thermoforming, may, if desired, be used. One skilled in the art can choose an appropriate temperature, pressure or vacuum and dwell time to achieve an appropriate pocket. The amount of vacuum or pressure and the thermoforming temperature used depend on the thickness
10 and porosity of the film and on the polymer or mixture of polymers being used. Thermoforming of PVOH films is known and described in, for example, WO 00/55045.

A suitable forming temperature for PVOH or
15 ethoxylated PVOH is, for example, from 90 to 130°C, especially 90 to 120°C. A suitable forming pressure is, for example, 69 to 138kPa (10 to 20 p.s.i.), especially 83 to 117 kPa (12 to 17 p.s.i.). A suitable forming vacuum is 0 to 4 kPa (0 to 40 mbar), especially 0 to 2
20 kPa (0 to 20 mbar). A suitable dwell time is, for example, 0.4 to 2.5 seconds, especially 2 to 2.5 seconds.

While desirably conditions are chosen within the above ranges, it is possible to use one or more of these
25 parameters outside the above ranges, although it may be necessary to compensate by changing the values of the other two parameters.

When the container comprises more than one
30 compartment, each compartment may be formed by any of the above mentioned techniques.

The compartments are then filled with the desired compositions. The compartments may be completely filled
35 or only partially filled. The solid may be, for example, a particulate or granulated solid, or a tablet. The

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5 liquid may be non-aqueous or aqueous, for example comprising less than or more than 5% total or free water. The composition may have more than one phase. For example, it may comprise an aqueous liquid and a liquid which is immiscible with the aqueous liquid.

10

The container may contain more than one component; for instance it may contain two components which are incompatible with each other. It may also contain a component, which is incompatible with the part of the
15 container enclosing the other component. For example, the second composition may be incompatible with the part of the container enclosing the first composition.

If it is desired that the container releases the
20 components, it is possible to ensure that the components are released at different times. Thus, for instance, one composition can be released immediately the container is added to water, whereas the other may be released later. This may be achieved by having a compartment, which takes
25 longer to dissolve surrounding one of the compositions, which may be either the first or the second composition. This may be achieved, for example, by having different compartment wall thicknesses. Alternatively, the second composition may simply be held on the outside of the
30 sealing member, in which case it can start to dissolve as soon as the article is added to water. In the case of use of a multicompartment packaging different release times may also be achieved by choosing compartments, which dissolve at different temperatures, for example the
35 different temperatures encountered during the cycle of a laundry or dish washing machine.

5

Alternatively the packaging may be formed of, for example, a moulded composition, especially one produced by injection moulding or blow moulding. The walls of the compartment may, for example, have a thickness of greater
10 than 100 μm , for example greater than 150 μm or greater than 200 μm , 300 μm , 500 μm , 750 μm or 1 mm. Preferably the walls have a thickness of from 200 to 400 μm .

The composition may be a fabric care, surface care
15 or dishwashing composition. Thus, for example, it may be a dishwashing, water softening, laundry or detergent composition, or a rinse aid. Such compositions may be suitable for use in a domestic washing machine. The composition may also be a disinfectant, antibacterial or
20 antiseptic composition, or a refill composition for a trigger-type spray. Such compositions are generally packaged in amounts of from 5 to 100 g, especially from 15 to 40 g. For example, a dishwashing composition may weigh from 15 to 30 g, a water-softening composition may
25 weigh from 15 to 40 g.

The composition, if in liquid form, may be anhydrous or comprise water, for example at least 5 wt %, preferably at least 10 wt%, water based on the weight of
30 the aqueous composition.

In case more than one composition is packaged, the compositions may be the same or different. If they are different, they may, nevertheless, have one or more
35 individual components in common.

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5 In a possible execution a sealing member is placed on top of the first compartment previously filled and sealed thereto.

 The sealing member may be produced by, for example,
10 injection moulding or blow moulding. It may also be in the form of a film.

 The sealing member may optionally comprise a second composition at the time it is placed on top of the first
15 compartment. This may be held or otherwise adhered on the sealing member. For example it can be in the form of a solid composition such as a ball or pill held on the sealing member by an adhesive or mechanical means. This is especially appropriate when the sealing member has a
20 degree of rigidity, such as when it has been produced by injection moulding. It is also possible for a previously prepared container containing the second composition to be adhered to the sealing member. For example, a sealing member in the form of a film may have a filled
25 compartment containing a composition attached thereto. The second composition or compartment may be held on either side of the sealing member such that it is inside or outside the first compartment.

30 Generally, however, the second composition is held within a second compartment in the sealing member. This is especially appropriate when the sealing member is flexible, for example in the form of a film.

35 The sealing member is placed on top of the first compartment and sealed thereto. For example the sealing

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5 member in the form of a film may be placed over a filled pocket and across the sealing portion, if present, and the films sealed together at the sealing portion. In general there is only one second compartment or composition in or on the sealing member, but it is
10 possible to have more than one second compartment or composition, if desired, for example 2 or 3 second compartments or compositions.

The second compartment may be formed by any
15 technique. For example it can be formed by vertical form fill sealing the second composition within a film, such as by the process described in WO 89/12587. It can also be formed by having an appropriate shape for injection moulding.

20

However, it is preferred to use a vacuum forming or thermoforming technique, such as that previously described in relation to the first compartment of the container of the present invention. Thus, for example, a
25 pocket surrounded by a sealing portion is formed into a film, the pocket is filled with the second composition, a film is placed on top of the filled pocket and across the sealing portion and the films are sealed together at the sealing portion. In general, however, the film placed on
30 top of the filled pocket to form the second compartment does not itself comprise a further compartment.

Further details of this thermoforming process are generally the same as those given above in relation to
35 the first compartment of the container of the present

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5 invention. All of the above details are incorporated by reference thereto, with the following differences:

The second compartment is generally smaller than the first compartment, since the film containing the second
10 composition is used to form a lid on the pocket. In general the first compartment and the second compartment (or composition if not held within a compartment) have a volume ratio of from 2:1 to 20:1, more preferably 4:1 to 10:1. Generally the second compartment does not extend
15 across the sealing portion.

The thickness of the film comprising the second compartment may also be less than the thickness of the film making up the first compartment of the container of
20 the present invention, because the film is not subjected to as much localised stretching in the thermoforming step. It is also desirable to have a thickness which is less than that of the film used to form the first compartment to ensure a sufficient heat transfer through
25 the film to soften the base web, if heat sealing is used.

The thickness of the covering film is generally from 20 to 160 μm , preferably from 40 to 100 μm , such as 40 to 80 μm or 50 to 60 μm .

30

This film may be a single-layered film, but is desirably laminated to reduce the possibility of pinholes allowing leakage through the film. The film may be the same as or different from the film forming the first
35 compartment. If two or more films are used to form the film comprising the second compartment, the films may be

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5 the same or different. Examples of suitable films are those given for the film forming the first compartment.

The first compartment and the sealing member may be sealed together by any suitable means, for example by
10 means of an adhesive or by heat sealing. Mechanical means is particularly appropriate if both have been prepared by injection moulding. Other methods of sealing include infrared, radio frequency, ultrasonic, laser, solvent, vibration and spin welding. An adhesive such as
15 an aqueous solution of PVOH may also be used. The seal desirably is water-soluble if the containers are water-soluble.

If heat sealing is used, a suitable sealing
20 temperature is, for example, 120 to 195°C, for example 140 to 150°C. A suitable sealing pressure is, for example, from 250 to 600 kPa. Examples of sealing pressures are 276 to 552 kPa (40 to 80 p.s.i.), especially 345 to 483 kPa (50 to 70 p.s.i.) or 400 to 800
25 kPa (4 to 8 bar), especially 500 to 700 kPa (5 to 7 bar) depending on the heat-sealing machine used. Suitable sealing dwell times are 0.4 to 2.5 seconds.

One skilled in the art can use an appropriate
30 temperature, pressure and dwell time to achieve a seal of the desired integrity. While desirably conditions are chosen within the above ranges, it is possible to use one or more of these parameters outside the above ranges, although it would might be necessary to compensate by
35 changing the values of the other two parameters.

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5 In a second embodiment of the invention, the sealing member does not comprise the second composition at the time it is placed on top of the first component. Instead the second composition is added afterwards. Thus, for example, it may be adhered to the sealing member by means
10 of an adhesive. It may also be adhered by mechanical means, particularly when the sealing member has a degree of rigidity, for example when injection moulding has produced it. Another possibility is for the sealing member to contain an indentation, which is filled, either
15 before or after sealing, by a liquid composition, which is allowed to gel in-situ.

 If more than one container is formed at the same time from the same sheet, the containers may then be
20 separated from each other, for example by cutting the sealing portions, or flanges. Alternatively, they may be left conjoined and, for example, perforations provided between the individual containers so that they can be easily separated at a later stage, for example by a
25 consumer. If the containers are separated, the flanges may be left in place. However, desirably the flanges are partially removed in order to provide an even more attractive appearance. Generally the flanges remaining should be as small as possible for aesthetic purposes
30 while bearing in mind that some flange is required to ensure the two films remain adhered to each other. A flange having a width of 1 mm to 8 mm is desirable, preferably 2 mm to 7 mm, most preferably about 5 mm.

35 The containers may themselves be packaged in outer containers if desired, for example non-water soluble

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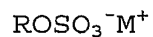
5 containers, which are removed, before the water-soluble containers are used.

The containers produced by the process of the present invention, especially when used for a fabric
10 care, surface care or dishwashing composition, may have a maximum dimension of 5 cm, excluding any flanges. For example, a container may have a length of 1 to 5 cm, especially 3.5 to 4.5 cm, a width of 1.5 to 3.5 cm, especially 2 to 3 cm, and a height of 1 to 2 cm,
15 especially 1.25 to 1.75 cm.

The ingredients of the compositions depend on the use of such compositions. Thus, for example, the composition may contain surface-active agents such as an
20 anionic, nonionic, cationic, amphoteric or zwitterionic surface-active agents or mixtures thereof.

Examples of anionic surfactants are straight-chained or branched alkyl sulfates and alkyl polyalkoxylated
25 sulfates, also known as alkyl ether sulfates. Such surfactants may be produced by the sulfation of higher C₈-C₂₀ fatty alcohols.

Examples of primary alkyl sulfate surfactants are
30 those of formula:



wherein R is a linear C₈-C₂₀ hydrocarbyl group and M is a water-solubilising cation. Preferably R is C₁₀-C₁₆ alkyl, for example C₁₂-C₁₄, and M is alkali metal such as
35 lithium, sodium or potassium.

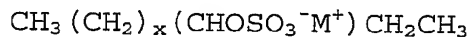
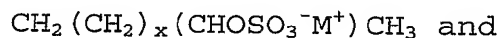
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5 Examples of secondary alkyl sulfate surfactants are those which have the sulfate moiety on a "backbone" of the molecule, for example those of formula:



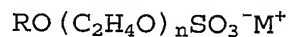
wherein m and n are independently 2 or more, the sum of
10 m+n typically being 6 to 20, for example 9 to 15, and M is a water-solubilising cation such as lithium, sodium or potassium.

Especially preferred secondary alkyl sulfates are
15 the (2,3) alkyl sulfate surfactants of formulae:



20 for the 2-sulfate and 3-sulfate, respectively. In these formulae x is at least 4, for example 6 to 20, preferably 10 to 16. M is cation, such as an alkali metal, for example lithium, sodium or potassium.

25 Examples of alkoxyated alkyl sulfates are ethoxylated alkyl sulfates of the formula:



30 wherein R is a C₈-C₂₀ alkyl group, preferably C₁₀-C₁₈ such as a C₁₂-C₁₆, n is at least 1, for example from 1 to 20, preferably 1 to 15, especially 1 to 6, and M is a salt-forming cation such as lithium, sodium, potassium,
35 ammonium, alkylammonium or alkanolammonium. These compounds can provide especially desirable fabric

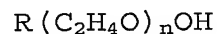
17-

5 cleaning performance benefits when used in combination with alkyl sulfates.

The alkyl sulfates and alkyl ether sulfates will generally be used in the form of mixtures comprising
10 varying alkyl chain lengths and, if present, varying degrees of alkoxylation.

Other anionic surfactants, which may be employed, are salts of fatty acids, for example C₈-C₁₈ fatty acids,
15 especially the sodium or potassium salts, and alkyl, for example C₈-C₁₈, benzene sulfonates.

Examples of nonionic surfactants are fatty acid alkoxyates, such as fatty acid ethoxyates, especially
20 those of formula:



wherein R is a straight or branched C₈-C₁₆ alkyl group, preferably a C₉-C₁₅, for example C₁₀-C₁₄, alkyl group and n
25 is at least 1, for example from 1 to 16, preferably 2 to 12, more preferably 3 to 10.

The alkoxyated fatty alcohol nonionic surfactant
30 will frequently have a hydrophilic-lipophilic balance (HLB) which ranges from 3 to 17, more preferably from 6 to 15, most preferably from 10 to 15.

Examples of fatty alcohol ethoxyates are those made
35 from alcohols of 12 to 15 carbon atoms and which contain about 7 moles of ethylene oxide. Such materials are

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5 commercially marketed under the trademarks Neodol 25-7
and Neodol 23-6.5 by Shell Chemical Company. Other
useful Neodols include Neodol 1-5, an ethoxylated fatty
alcohol averaging 11 carbon atoms in its alkyl chain with
about 5 moles of ethylene oxide; Neodol 23-9, an
10 ethoxylated primary C₁₂-C₁₃ alcohol having about 9 moles
of ethylene oxide; and Neodol 91-10, an ethoxylated C₉-C₁₁
primary alcohol having about 10 moles of ethylene oxide.

Alcohol ethoxylates of this type have also been
15 marketed by Shell Chemical Company under the Dobanol
trademark. Dobanol 91-5 is an ethoxylated C₉-C₁₁ fatty
alcohol with an average of 5 moles ethylene oxide and
Dobanol 25-7 is an ethoxylated C₁₂-C₁₅ fatty alcohol with
an average of 7 moles of ethylene oxide per mole of fatty
20 alcohol.

Other examples of suitable ethoxylated alcohol
nonionic surfactants include Tergitol 15-S-7 and Tergitol
15-S-9, both of which are linear secondary alcohol
25 ethoxylates available from Union Carbide Corporation.
Tergitol 15-S-7 is a mixed ethoxylated product of a C₁₁-
C₁₅ linear secondary alkanol with 7 moles of ethylene
oxide and Tergitol 15-S-9 is the same but with 9 moles of
ethylene oxide.

30

Other suitable alcohol ethoxylated nonionic
surfactants are Neodol 45-11, which is a similar ethylene
oxide condensation products of a fatty alcohol having 14-
15 carbon atoms and the number of ethylene oxide groups
35 per mole being about 11. Such products are also
available from Shell Chemical Company.

5

Further nonionic surfactants are, for example, C₁₀-C₁₈ alkyl polyglycosides, such as C₁₂-C₁₆ alkyl polyglycosides, especially the polyglucosides. These are especially useful when high foaming compositions are
10 desired. Further surfactants are polyhydroxy fatty acid amides, such as C₁₀-C₁₈ N-(3-methoxypropyl) glucamides and ethylene oxide-propylene oxide block polymers of the Pluronic type.

15 Examples of cationic surfactants are those of the quaternary ammonium type.

The total content of surfactants in the composition is desirably 60 to 95 wt%, especially 75 to 90 wt%.
20 Desirably an anionic surfactant is present in an amount of 50 to 75 wt%, the nonionic surfactant is present in an amount of 5 to 20 wt%, and/or the cationic surfactant is present in an amount of from 0 to 20 wt%. The amounts are based on the total solids content of the composition,
25 i.e. excluding any solvent, which may be present.

The composition, particularly when used as laundry washing or dishwashing composition, may also comprise enzymes, such as protease, lipase, amylase, cellulase and
30 peroxidase enzymes. Such enzymes are commercially available and sold, for example, under the registered trademarks Esperase, Alcalase and Savinase by Novo Industries A/S and Maxatase by International Biosynthetics, Inc. Desirably the enzymes are present
35 in the composition in an amount of from 0.5 to 3 wt%, especially 1 to 2 wt%.

5

The composition may, if desired, comprise a thickening agent or gelling agent. Suitable thickeners are polyacrylate polymers such as those sold under the trademark CARBOPOL, or the trademark ACUSOL by Rohm and
10 Haas Company. Other suitable thickeners are xanthan gums. The thickener, if present, is generally present in an amount of from 0.2 to 4 wt%, especially 0.5 to 2 wt%.

Dishwasher compositions usually comprise a
15 detergency builder. Suitable builders are alkali metal or ammonium phosphates, polyphosphates, phosphonates, polyphosphonates, carbonates, bicarbonates, borates, polyhydroxysulfonates, polyacetates, carboxylates such as citrates, and polycarboxylates. The builder is desirably
20 present in an amount of up to 90 wt%, preferably 15 to 90 wt%, more preferable 15 to 75 wt%, relative to the total weight of the composition. Further details of suitable components are given in, for example, EP-A-694,059, EP-A-518,720 and WO 99/06522.

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The compositions can also optionally comprise one or more additional ingredients. These include conventional detergent composition components such as further
30 surfactants, bleaches, bleach enhancing agents, builders, suds boosters or suds suppressors, anti-tarnish and anti-corrosion agents, organic solvents, co-solvents, phase stabilisers, emulsifying agents, preservatives, soil suspending agents, soil release agents, germicides, pH adjusting agents or buffers, non-builder alkalinity
35 sources, chelating agents, clays such as smectite clays, enzyme stabilisers, anti-limescale agents, colorants,

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5 dyes, hydrotropes, dye transfer inhibiting agents, brighteners, and perfumes. If used, such optional ingredients will generally constitute no more than 10 wt%, for example from 1 to 6 wt%, the total weight of the compositions.

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The builders counteract the effects of calcium, or other ion, water hardness encountered during laundering or bleaching use of the compositions herein. Examples of such materials are citrate, succinate, malonate, 15 carboxymethyl succinate, carboxylate, polycarboxylate and polyacetyl carboxylate salts, for example with alkali metal or alkaline earth metal cations, or the corresponding free acids. Specific examples are sodium, potassium and lithium salts of oxydisuccinic acid, 20 mellitic acid, benzene polycarboxylic acids, C₁₀-C₂₂ fatty acids and citric acid. Other examples are organic phosphonate type sequestering agents such as those sold by Monsanto under the trademark Dequest and alkylhydroxy phosphonates. Citrate salts and C₁₂-C₁₈ fatty acid soaps 25 are preferred.

Other suitable builders are polymers and copolymers known to have builder properties. For example, such materials include appropriate polyacrylic acid, 30 polymaleic acid, and polyacrylic/polymaleic acid copolymers and their salts, such as those sold by BASF under the trademark Sokalan.

The builders generally constitute from 0 to 3 wt%, 35 more preferably from 0.1 to 1 wt%, by weight of the compositions.

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Compositions, which comprise an enzyme, may optionally contain materials, which maintain the stability of the enzyme. Such enzyme stabilisers include, for example, polyols such as propylene glycol, boric acid and borax. Combinations of these enzyme stabilisers may also be employed. If utilised, the enzyme stabilisers generally constitute from 0.1 to 1 wt% of the compositions.

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The compositions may optionally comprise materials, which serve as phase stabilisers and/or co-solvents. Examples are C₁-C₃ alcohols such as methanol, ethanol and propanol. C₁-C₃ alkanolamines such as mono-, di- and triethanolamines can also be used, by themselves or in combination with the alcohols. The phase stabilisers and/or co-solvents can, for example, constitute 0 to 1 wt%, preferably 0.1 to 0.5 wt%, of the composition.

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The compositions may optionally comprise components, which adjust or maintain the pH of the compositions at optimum levels. The pH may be from, for example, 1 to 13, such as 8 to 11 depending on the nature of the composition. For example a dishwashing composition desirably has a pH of 8 to 11, a laundry composition desirable has a pH of 7 to 9, and a water-softening composition desirably has a pH of 7 to 9. Examples of pH adjusting agents are NaOH and citric acid.

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The primary composition and the secondary composition may be appropriately chosen depending on the desired use of the article.

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If the article is for use in laundry washing, the first composition may comprise, for example, a detergent, and the second composition may comprise a bleach, stain remover, water-softener, enzyme or fabric conditioner.

10 The article may be adapted to release the compositions at different times during the laundry wash. For example, a bleach or fabric conditioner is generally released at the end of a wash, and a water softener is generally released at the start of a wash. An enzyme may be released at the

15 start or the end of a wash.

If the article is for use as a fabric conditioner, the first composition may comprise a fabric conditioner and the second composition may comprise an enzyme, which

20 is released before or after the fabric conditioner in a rinse cycle.

If the article is for use in dish washing the first composition may comprise a detergent and the second

25 composition may comprise a water-softener, salt, enzyme, rinse aid, bleach or bleach activator. The article may be adapted to release the compositions at different times during the laundry wash. For example, a rinse aid, bleach or bleach activator is generally released at the

30 end of a wash, and a water softener, salt or enzyme is generally released at the start of a wash.

The containers of the present invention will now be further described with reference to Figures 1 to 5.

35 These illustrate examples of containers, which can be produced

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Each figure shows an article containing a liquid (or gel) composition and a solid having a size retained in a 2.5 mm mesh.

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Figures 1 to 5 are schematic representations of different embodiments of the packaged detergent composition according to the present invention, wherein Figs. 1 and 2 show mono-compartment embodiments, whereas Figs. 3, 4, and 5 show multi-compartment embodiments.

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In all figures the same reference numerals have been used for similar parts.

Fig. 1 shows a first mono-compartment embodiment of the packaged detergent composition of the present invention. A container 1, preferably made of water-soluble material, contains two different phases, namely a liquid (or gel) phase 10 and a gaseous phase 12. A solid 20 can be seen floating at the liquid gas interface 11. By adjusting the density of the solid 20 to be comprised between the density of the liquid phase 10 and the density of the gaseous phase 12, the movement of the solid 20 is restricted to be in the region of liquid gas interface 13 whereby a contact with the outer wall 2 of the container 1 is reliably avoided.

Another mono-compartment embodiment of the packaged detergent composition of the present invention can be seen from Fig. 2. The difference to the embodiment of Fig. 1 is the presence of two liquid (or gel) phases (or one liquid and one gel phase) instead of only one liquid

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5 (or gel) phase, being immiscible and having different densities. Again a gaseous phase 12 can be seen on top of the second liquid phase 10'.

10 In this embodiment, the density of the solid 20 is adjusted to be between the density of the first liquid phase 10 and the density of the second liquid phase 10' so that it is floating at the liquid interface 13 of the two phases. Alternatively, the density of the solid could also be adjusted to be between the density of the second
15 liquid phase 10' and the gaseous phase 12 to float at the liquid gas interface 14 (as in Fig. 1). Again, adjustment of the density of the solid between the densities of two of the phases thereby resulting in a floating of the solid at the respective interface, reliably avoiding any
20 contact of the solid with the outer wall 2 of the container 1.

Fig. 3 shows the first multi-compartment embodiment of the packaged detergent composition of the present
25 invention. In the specific embodiment of Fig. 3, compartment 3 of the container 1 contains a gel composition 10 whereas compartment 4 thereof contains a powder composition 15. Compartments 3 and 4 are separated by separation wall 5. The solid 20 in this case is
30 attached, for example glued, at a point or area on the top portion of outer wall 2 of the container 1. For the reasons set out herein-above, this point or area 2 is located sufficiently far from the seal area 6 of the container so that the solid 20 will not get into contact
35 with the seal.

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5 A further, related embodiment is shown in Fig. 4, where the solid is restricted in its movement by "encapsulating" it within a part of compartment 3 kept between the outer wall 2 and the separation wall 5. Again, the solid is located sufficiently far from the
10 seal area 6 to avoid contact.

 Finally, Fig. 5 shows another multi-compartment embodiment of the packaged detergent composition of the present invention. In this embodiment the two
15 compartments, namely compartment 3 with e.g. gel material 10 and compartment 4 with e.g. powder material 15, are arranged side by side separated by a separation wall 5. Again, similar to Fig. 4, solid 20 is "encapsulated" in an area of the separation wall sufficiently far from the
20 seal area 6.

 It is obvious for someone skilled in the art that there are more and other embodiments of the packaged detergent composition of the present application
25 achieving the basic feature of the invention, namely to restrict the movement of the solid within the container.

 The features disclosed in the foregoing description, in the claims and/or drawings may, both separately and in
30 any combination thereof be material for realising the invention in diverse forms thereof.

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Claims

1. A packaged detergent composition comprising a container (1) that at least partly disintegrates in an aqueous environment, the container having at least one compartment, the detergent composition having at least one fluid phase (10) and at least one solid (20) substantially insoluble in the fluid phase (10) wherein the movement of the at least one solid (20) within the container (1) is restricted.
2. A packaged detergent composition according to claim 1, characterised in that the solid (20) has a size sufficient to be retained by a 2.5 mm mesh.
3. A packaged detergent composition according to any of the preceding claims, wherein at least one compartment of the container (1) holds at least a portion of said fluid phase (10), at least one further phase (12; 10') having a density different from the density of the fluid phase (10) and at least one solid (20) which has a density comprised between the density of the fluid phase (10) and the density of the further phase (17; 10').
4. A packaged detergent composition according to claim 3 wherein the two fluid phases are mutually immiscible.
5. A packaged detergent composition according to any of claims 3 or 4 wherein the further phase is another fluid phase (10').

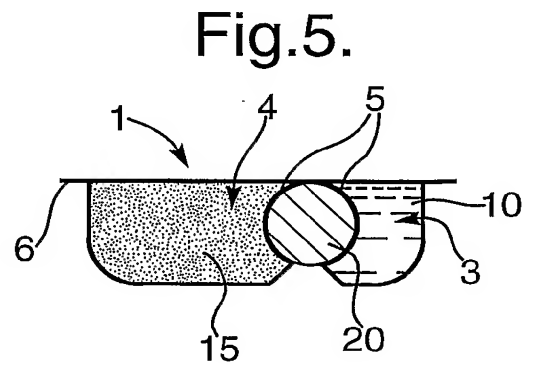
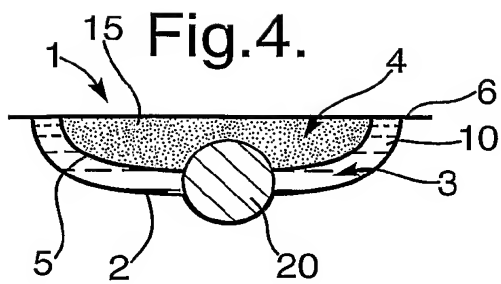
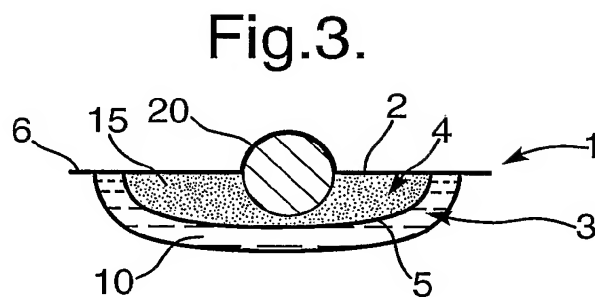
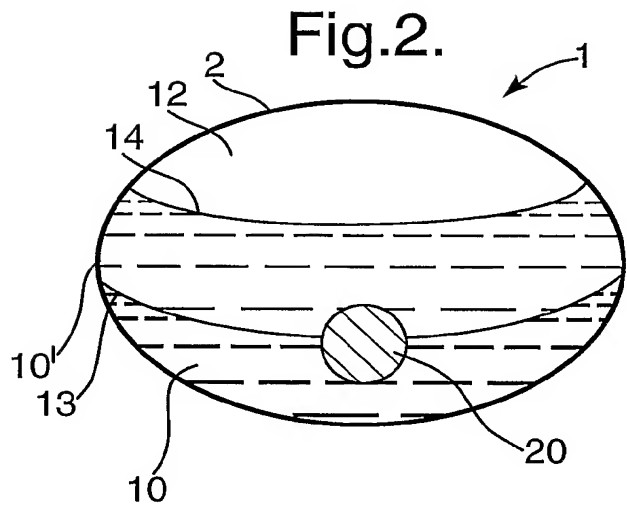
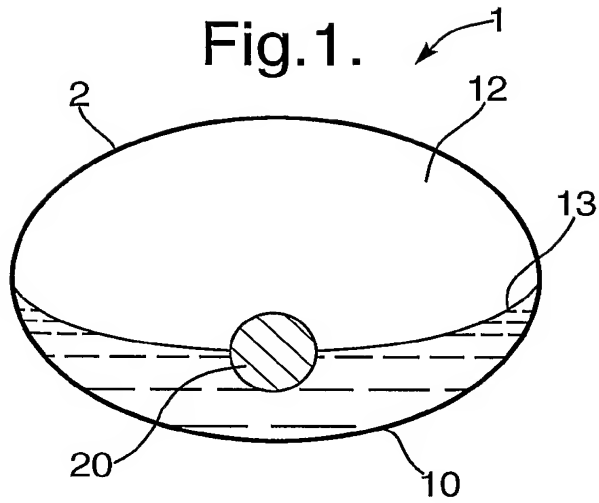
28 -

- 5 6. A packaged detergent composition according to any of
 claims 3 or 4 wherein the further phase is a gaseous
 phase (12).
7. A packaged detergent composition according to any of
 claims 3 or 4 wherein the further phase is a solid
10 phase.
8. A packaged detergent composition according to any of
 claims 1 or 2 wherein the at least one solid (20) is
 at least partly in contact with the outer wall (2)
 of the container (1) and/or at least one separation
15 wall (5) between compartments (3, 4).
9. A packaged detergent composition according to any of
 claims 1, 2 or 8, wherein the solid's movement is
 restricted by having a solid with a large relative
 volume compared with the inside of the container in
20 which it is held.
10. A packaged detergent composition according to
 claim 9, wherein the space within the compartment in
 which the solid is held is greater than 20%v/v,
 ideally greater than 50%v/v occupied by the solid.
- 25 11. A packaged detergent composition according to
 any of claims 9 or 10 wherein the container
 comprises at least two sheets of water-soluble
 material sealed (6) at their periphery in order to
 form a container wherein the maximum separation
30 under non-stressed conditions of the two films is
 equal or smaller to the smallest dimension of the at
 least one solid.

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- 5 12. A packaged detergent composition according to
 claims 9 or 10 wherein that the at least one solid
 (20) is retained between at least two of the
 container walls (2, 5).
- 10 13. A packaged detergent composition according to
 claim 8 wherein that the at least one solid (20) is
 attached at a fixed point or area (2') onto the
 walls (2) of the container.
- 15 14. A packaged detergent composition according to
 claim 13 wherein the point or area (2') where the
 solid (20) is attached is sufficiently far from the
 seal area (6) so that the solid (20) will not get
 into contact with the seal.
- 20 15. A packaged detergent composition according to
 claims 13 or 14 wherein that the at least one solid
 (20) is glued to a fixed point or area (2') on the
 container walls (2).
16. Use of packaged detergent composition according
 to any one of claims 1 to 15 in an automatic
 dishwashing machine.
- 25 17. Use of packaged detergent composition of any
 one of claims 1 to 15 in a laundry washing machine

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 03/00100

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 C11D17/04 C11D17/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 01 83658 A (PROCTER & GAMBLE) 8 November 2001 (2001-11-08) claims 11-14 examples page 10, line 20 - line 26 page 17, line 28 -page 18, line 2 page 19, line 18 - line 23 ---	1,8,16, 17
P,X	WO 02 057402 A (PROCTER & GAMBLE) 25 July 2002 (2002-07-25) claims example 2B page 2, last paragraph page 7, paragraph 5 --- -/--	1-3,6, 16,17

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

14 April 2003

Date of mailing of the international search report

25/04/2003

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 03/00100

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